To: Bill Shaffer

From: Jim Goddard

Subject: Watertight IB

As a follow-up to our conversation Friday, I offer the following suggestions regarding the development of a modified IB bell designed to achieve a watertight joint as defined by ASTM D 3212:

1. Define your limits in terms of tolerances and define the potential materials that may be appropriate for reinforcing the bell in hoop tension.
   The tolerance limits are already known, I believe. The question is, What can be done to substantially improve the current production variations in bell and spigot dimensions? Will the use of a tighter resin standard (such as the proposed AASHTO M 294M changes) achieve a tighter range? Do we know?
   In terms of reinforcing materials, I believe we can eliminate some materials as incompatible with polyethylene, such as steel wire. I would focus on various forms of fiberglass, polypropylene, polyester, or nylon. I would probably ignore carbon fiber or Kevlar as cost prohibitive. I would determine the tensile strength requirements in hoop tension and select the materials accordingly (shape, thickness, etc.). I would look at strapping type material, not continuous fibers. I would look at the means necessary to maintain a continuous hoop (joining the strap ends. I would absolutely encapsulate the material in PE, with a PE overlay. (Some of these materials are sensitive to water, particularly e-glass and nylon, so a tight protective layer may be a bigger issue with some product than with others.

   I would suggest you work with one of Dave Kelley's people in New Miami on the production side of this issue.

2. After you have set your tolerance limits and selected a few materials for trial, I would recommend you produce about 6 samples of each in a representative size and test them to failure (not just 10.8 psi) using

existing bell shapes and current gaskets. At that point, it might be appropriate to report those findings to everyone involved in this issue. Also, at this time some description of what it will take to make this a production item (plant issues) should be presented.

3. Then, the cost implications must be considered and presented. Would a cost differential for one material over another make sense if the differences in performance were small?

4. At this point, what other modifications must be made to existing product? Do the bell & spigot molds need to be changed? What are the Costs of those changes? Would they apply to all IB made and sold? All sizes?
   Increasing the size of the gaskets, the relative difficulty of pushing them home must be considered. If the force is too great we may create a problem with installation damage to the pipe or joint.

5. If I were you, I would report on the completion of each step, in writing.

From these steps, you should be able to come up with a rational solution to this issue that can be put into production in a cost-effective, timely manner.

cc: Tom King